12-10-2020

The Age and Origin of Precambrian Orthogneiss of the Grouse Creek Block, Northern Utah and Southern Idaho

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THE AGE AND ORIGIN OF PRECAMBRIAN ORTHOGNEISS OF THE GROUSE CREEK BLOCK, NORTHERN UTAH AND SOUTHERN IDAHO

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Significance & Geologic Setting

We use U-Pb geochronology and Lu/Hf isotope geochemistry in Albion-Raft River-Grouse Creek metamorphic core complex (ARGMCC) zircons to unravel the timing and evolution of magmatism in the Grouse Creek block (GC), a Precambrian crustal terrane

- The ARGMCC is one of several metamorphic core complexes in the North American Cordilleran hinterland (Isakson, 2012) and provides one of the best exposures of the GC and a record of crustal processes stretching over 2 billion years (Foster et al., 2006; Strickland et al., 2011; Isakson, 2012; Konstantinou et al., 2013)
- Our work, coupled with new research from collaborators at Weber State University, will resolve the tectonic origin and temporal relationships between the GC and its neighboring crustal province, the Farmington zone

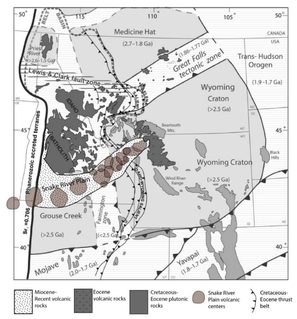

Figure 1. Map of the Yellowstone Snake River Plain showing basement provinces. Modified from Foster et al. (2006), Anders et al. (2009), Mueller et al. (2011), and Potter et al. (in prep).

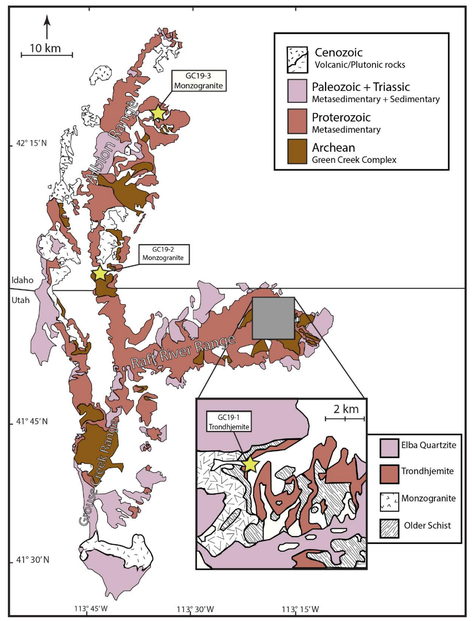

Figure 2. Generalized geologic map of outcrop exposures. Samples were collected at locations marked by yellow stars. Modified from Armstrong (1968b), Compton (1972, 1975), Compton et al. (1977), Doelling (1980), Wells (2001), Harris et al. (2007), Miller et al. (2008), Strickland (2001), and Isakson (2012).

Results

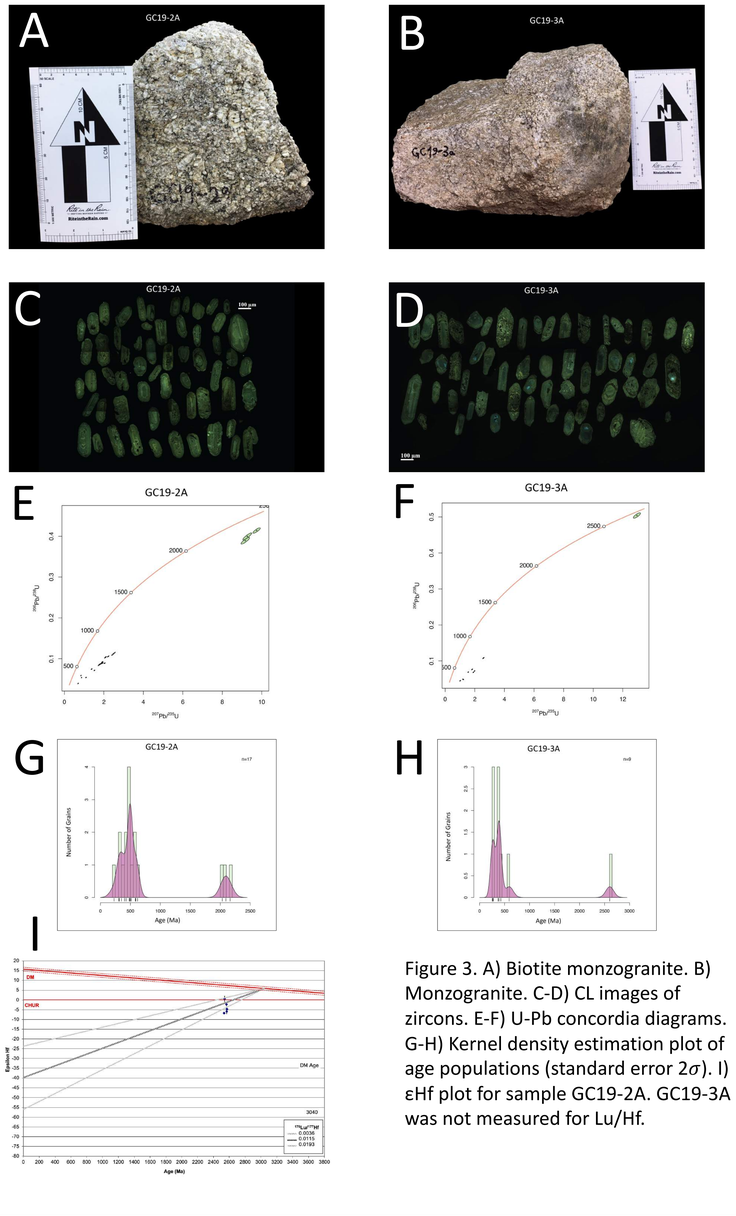

Figure 3. A) Biotite monzogranite. B) Monzogranite. C-D) CL images of zircons. E-F) U-Pb concordia diagrams. G-H) Kernel density estimation plot of age populations (standard error 2σ). I) εHf plot for sample GC19-2A. GC19-3A was not measured for Lu/Hf.

Methods

Three samples were collected: two monzogranites from the Albion Range and one trondhjemite from the Raft River Range. One sample from the Raft River Range did not yield zircons and is not featured in this study

- Zircons were extracted through the mineral separation process before being sent to the University of Arizona LaserChron Center (ALC) for U-Pb and Lu/Hf analyses
- Cathodoluminescence (CL) images were obtained to identify viable zircons
- U-Pb and Lu/Hf isotope concentrations were measured using laser ablation inductively-coupled mass spectrometry (LA-ICP-MS) at ALC

Figure 4. Collecting monzogranite samples in southern Idaho.

Conclusions

- U-Pb ages record GC formation at ~2.5 Ga
- Possible tectonic event at 500 Ma (Antler Orogeny?)
- Epsilon Hf values show derivation from the partial melt of continental crust

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References

Please contact author for detailed references

Study conducted with funding from a USU Undergraduate Research and Creative Opportunity Grant and lab assistance from the USU Geosciences Department, the ISU Department of Geosciences, the Arizona LaserChron Center, and collaborators at WSU